



#6

1

SEQUENCE LISTING

<110> ADNEY, WILLIAM S.
DING, SHI-YOU
MCCARTER, SUZANNE
HIMMEL, MICHAEL E.
DECKER, STEPHEN R.
VINZANT, TODD B.

<120> THERMAL TOLERANT EXOGLUCANASE FROM ACIDOTHERMUS
CELLULOLYTICUS

<130> 40197.5US01

<140> 09/917,384

<141> 2001-07-28

<160> 11

<170> PatentIn Ver. 2.1

<210> 1

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<212> PRT

<213> Acidothermus cellulolyticus

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35 40 45

Pro Ser Asp Asn Gln Ile Lys Pro Gly Leu Gln Leu Val Asn Thr Gly
50 55 60

Ser Ser Ser Val Asp Leu Ser Thr Val Thr Val Arg Tyr Trp Phe Thr
65 70 75 80

Arg Asp Gly Gly Ser Ser Thr Leu Val Tyr Asn Cys Asp Trp Ala Ala
85 90 95

Met Gly Cys Gly Asn Ile Arg Ala Ser Phe Gly Ser Val Asn Pro Ala
100 105 110

Thr Pro Thr Ala Asp Thr Tyr Leu Gln Leu Ser Phe Thr Gly Gly Thr
115 120 125

Leu Ala Ala Gly Gly Ser Thr Gly Glu Ile Gln Asn Arg Val Asn Lys
130 135 140

Ser Asp Trp Ser Asn Phe Asp Glu Thr Asn Asp Tyr Ser Tyr Gly Thr
145 150 155 160

Asn	Thr	Thr	Phe	Gln	Asp	Trp	Thr	Lys	Val	Thr	Val	Tyr	Val	Asn	Gly	165	170	175
Val	Leu	Val	Trp	Gly	Thr	Glu	Pro	Ser	Gly	Ala	Thr	Ala	Ser	Pro	Ser	180	185	190
Ala	Ser	Ala	Thr	Pro	Ser	Pro	Ser	Ser	Ser	Pro	Thr	Thr	Ser	Pro	Ser	195	200	205
Ser	Ser	Pro	Ser	Pro	Ser	Ser	Ser	Pro	Thr	Pro	Thr	Pro	Ser	Ser	Ser	210	215	220
Ser	Pro	Pro	Pro	Ser	Ser	Asn	Asp	Pro	Tyr	Ile	Gln	Arg	Phe	Leu	Thr	225	230	235
Met	Tyr	Asn	Lys	Ile	His	Asp	Pro	Ala	Asn	Gly	Tyr	Phe	Ser	Pro	Gln	245	250	255
Gly	Ile	Pro	Tyr	His	Ser	Val	Glu	Thr	Leu	Ile	Val	Glu	Ala	Pro	Asp	260	265	270
Tyr	Gly	His	Glu	Thr	Thr	Ser	Glu	Ala	Tyr	Ser	Phe	Trp	Leu	Trp	Leu	275	280	285
Glu	Ala	Thr	Tyr	Gly	Ala	Val	Thr	Gly	Asn	Trp	Thr	Pro	Phe	Asn	Asn	290	295	300
Ala	Trp	Thr	Thr	Met	Glu	Thr	Tyr	Met	Ile	Pro	Gln	His	Ala	Asp	Gln	305	310	315
Pro	Asn	Asn	Ala	Ser	Tyr	Asn	Pro	Asn	Ser	Pro	Ala	Ser	Tyr	Ala	Pro	325	330	335
Glu	Glu	Pro	Leu	Pro	Ser	Met	Tyr	Pro	Val	Ala	Ile	Asp	Ser	Ser	Val	340	345	350
Pro	Val	Gly	His	Asp	Pro	Leu	Ala	Ala	Glu	Leu	Gln	Ser	Thr	Tyr	Gly	355	360	365
Thr	Pro	Asp	Ile	Tyr	Gly	Met	His	Trp	Leu	Ala	Asp	Val	Asp	Asn	Ile	370	375	380
Tyr	Gly	Tyr	Gly	Asp	Ser	Pro	Gly	Gly	Gly	Cys	Glu	Leu	Gly	Pro	Ser	385	390	395
Ala	Lys	Gly	Val	Ser	Tyr	Ile	Asn	Thr	Phe	Gln	Arg	Gly	Ser	Gln	Glu	405	410	415
Ser	Val	Trp	Glu	Thr	Val	Thr	Gln	Pro	Thr	Cys	Asp	Asn	Gly	Lys	Tyr	420	425	430
Gly	Gly	Ala	His	Gly	Tyr	Val	Asp	Leu	Phe	Ile	Gln	Gly	Ser	Thr	Pro	435	440	445
Pro	Gln	Trp	Lys	Tyr	Thr	Asp	Ala	Pro	Asp	Ala	Asp	Ala	Arg	Ala	Val	450	455	460

Gln Ala Ala Tyr Trp Ala Tyr Thr Trp Ala Ser Ala Gln Gly Lys Ala
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 Ser Ala Ile Ala Pro Thr Ile Ala Lys Ala Ser Gln Thr Gly Asp Tyr
 485 490 495
 Leu Arg Tyr Ser Leu Phe Asp Lys Tyr Phe Lys Gln Val Gly Asn Cys
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 Tyr Pro Ala Ser Ser Cys Pro Gly Ala Thr Gly Arg Gln Ser Glu Thr
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 Tyr Leu Ile Gly Trp Tyr Tyr Ala Trp Gly Gly Ser Ser Gln Gly Trp
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 580 585 590
 Phe Tyr Gln Trp Leu Gln Ser Ala Glu Gly Ala Ile Ala Gly Gly Ala
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 Thr Asn Ser Trp Asn Gly Asn Tyr Gly Thr Pro Pro Ala Gly Asp Ser
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 Trp Ser Ile Pro Ser Asn Leu Ser Trp Ser Gly Gln Pro Asp Thr Trp
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 705 710 715 720
 Ser Ser Gly Gln Asp Val Gly Val Ala Ala Ala Leu Ala Lys Thr Leu
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 Glu Tyr Tyr Ala Ala Lys Ser Gly Asp Thr Ala Ser Arg Asp Leu Ala
 740 745 750
 Lys Gly Leu Leu Asp Ser Met Trp Asn Asn Asp Gln Asp Ser Leu Gly
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Val Ser Thr Pro Glu Thr Arg Thr Asp Tyr Ser Arg Phe Thr Gln Val
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 Tyr Asp Pro Thr Thr Gly Asp Gly Leu Tyr Ile Pro Ser Gly Trp Thr
 785 790 795 800
 Gly Thr Met Pro Asn Gly Asp Gln Ile Lys Pro Gly Ala Thr Phe Leu
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 Ser Ile Arg Ser Trp Tyr Thr Lys Asp Pro Gln Trp Ser Lys Val Gln
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 Ala Tyr Leu Asn Gly Gly Pro Ala Pro Thr Phe Asn Tyr His Arg Phe
 835 840 845
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 Asn Thr Ser Ala Gln Ser Phe Ala Gly Asp Ser Asp Asp Gly Ile Ala
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Thr Ala Leu Thr Gln Ser Gly Lys Ser Val Thr Ala Lys Asn Leu Ser
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Tyr Asn Asn Val Ile Gln Pro Gly Gln Ser Thr Thr Phe Gly Phe Asn
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<212> DNA

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<211> 34

<212> PRT

<213> Acidothermus cellulolyticus

<400> 3

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His Ala

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<211> 153

<212> PRT

<213> Acidothermus cellulolyticus

<400> 4

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      20              25              30

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Ser Val Asp Leu Ser Thr Val Thr Val Arg Tyr Trp Phe Thr Arg Asp
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Gly Gly Ser Ser Thr Leu Val Tyr Asn Cys Asp Trp Ala Ala Met Gly
      50              55              60

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Cys Gly Asn Ile Arg Ala Ser Phe Gly Ser Val Asn Pro Ala Thr Pro
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Val	Asp	Leu	Phe	Ile	Gln	Gly	Ser	Thr	Pro	Pro	Gln	Trp	Lys	Tyr	Thr	
	210					215					220					
Asp	Ala	Pro	Asp	Ala	Asp	Ala	Arg	Ala	Val	Gln	Ala	Ala	Tyr	Trp	Ala	
225					230					235					240	
Tyr	Thr	Trp	Ala	Ser	Ala	Gln	Gly	Lys	Ala	Ser	Ala	Ile	Ala	Pro	Thr	
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Ile	Ala	Lys	Ala	Ser	Gln	Thr	Gly	Asp	Tyr	Leu	Arg	Tyr	Ser	Leu	Phe	
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Asp	Lys	Tyr	Phe	Lys	Gln	Val	Gly	Asn	Cys	Tyr	Pro	Ala	Ser	Ser	Cys	
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Pro	Gly	Ala	Thr	Gly	Arg	Gln	Ser	Glu	Thr	Tyr	Leu	Ile	Gly	Trp	Tyr	
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Tyr	Ala	Trp	Gly	Gly	Ser	Ser	Gln	Gly	Trp	Ala	Trp	Arg	Ile	Gly	Asp	
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Gly	Ala	Ala	His	Phe	Gly	Tyr	Gln	Asn	Pro	Leu	Ala	Ala	Trp	Ala	Met	
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Ser	Asn	Val	Thr	Pro	Leu	Ile	Pro	Leu	Ser	Pro	Thr	Ala	Lys	Ser	Asp	
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Trp	Ala	Ala	Ser	Leu	Gln	Arg	Gln	Leu	Glu	Phe	Tyr	Gln	Trp	Leu	Gln	
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Ser	Ala	Glu	Gly	Ala	Ile	Ala	Gly	Gly	Ala	Thr	Asn	Ser	Trp	Asn	Gly	
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Asn	Tyr	Gly	Thr	Pro	Pro	Ala	Gly	Asp	Ser	Thr	Phe	Tyr	Gly	Met	Ala	
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Tyr	Asp	Trp	Glu	Pro	Val	Tyr	His	Asp	Pro	Pro	Ser	Asn	Asn	Trp	Phe	
				405					410					415		
Gly	Phe	Gln	Ala	Trp	Ser	Met	Glu	Arg	Val	Ala	Glu	Tyr	Tyr	Tyr	Val	
			420					425					430			
Thr	Gly	Asp	Pro	Lys	Ala	Lys	Ala	Leu	Leu	Asp	Lys	Trp	Val	Ala	Trp	
		435					440					445				
Val	Lys	Pro	Asn	Val	Thr	Thr	Gly	Ala	Ser	Trp	Ser	Ile	Pro	Ser	Asn	
	450					455					460					
Leu	Ser	Trp	Ser	Gly	Gln	Pro	Asp	Thr	Trp	Asn	Pro	Ser	Asn	Pro	Gly	
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Thr	Asn	Ala	Asn	Leu	His	Val	Thr	Ile	Thr	Ser	Ser	Gly	Gln	Asp	Val	
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Gly Val Ala Ala Ala Leu Ala Lys Thr Leu Glu Tyr Tyr Ala Ala Lys
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 Ser Gly Asp Thr Ala Ser Arg Asp Leu Ala Lys Gly Leu Leu Asp Ser
 515 520 525
 Met Trp Asn Asn Asp Gln Asp Ser Leu Gly Val Ser Thr Pro Glu Thr
 530 535 540
 Arg Thr Asp Tyr Ser Arg Phe Thr Gln Val Tyr Asp Pro Thr Thr Gly
 545 550 555 560
 Asp Gly Leu Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly
 565 570 575
 Asp Gln Ile Lys Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Trp Tyr
 580 585 590
 Thr Lys Asp Pro Gln Trp Ser Lys Val Gln Ala Tyr Leu Asn Gly Gly
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 Pro Ala Pro Thr Phe Asn Tyr His Arg Phe Trp Ala Glu Ser Asp Phe
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 Ala Met Ala Asn Ala Asp Phe Gly Met Leu Phe Pro Ser Gly Ser Pro
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 Gln Ser Phe Ala Gly
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 35 40 45

Asn Tyr Trp Asn Thr Ala Leu Thr Gln Ser Gly Lys Ser Val Thr Ala
 50 55 60

Lys Asn Leu Ser Tyr Asn Asn Val Ile Gln Pro Gly Gln Ser Thr Thr
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Phe Gly Phe Asn Gly Ser Tyr Ser Gly Thr Asn Thr Ala Pro Thr Leu
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Ser Cys Thr Ala Ser
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<211> 6

<212> PRT

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic
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His His His His His His
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<210> 9

<211> 638

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<213> Acidothermus cellulolyticus

<400> 9

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Ala Asn Gly Tyr Phe Ser Pro Gln Gly Ile Pro Tyr His Ser Val Glu
 20 25 30

Thr Leu Ile Val Glu Ala Pro Asp Tyr Gly His Glu Thr Thr Ser Glu
 35 40 45

Ala Tyr Ser Phe Trp Leu Trp Leu Glu Ala Thr Tyr Gly Ala Val Thr
 50 55 60

Gly Asn Trp Thr Pro Phe Asn Asn Ala Trp Thr Thr Met Glu Thr Tyr
 65 70 75 80

Met	Ile	Pro	Gln	His	Ala	Asp	Gln	Pro	Asn	Asn	Ala	Ser	Tyr	Asn	Pro	85	90	95
Asn	Ser	Pro	Ala	Ser	Tyr	Ala	Pro	Glu	Glu	Pro	Leu	Pro	Ser	Met	Tyr	100	105	110
Pro	Val	Ala	Ile	Asp	Ser	Ser	Val	Pro	Val	Gly	His	Asp	Pro	Leu	Ala	115	120	125
Ala	Glu	Leu	Gln	Ser	Thr	Tyr	Gly	Thr	Pro	Asp	Ile	Tyr	Gly	Met	His	130	135	140
Trp	Leu	Ala	Asp	Val	Asp	Asn	Ile	Tyr	Gly	Tyr	Gly	Asp	Ser	Pro	Gly	145	150	155
Gly	Gly	Cys	Glu	Leu	Gly	Pro	Ser	Ala	Lys	Gly	Val	Ser	Tyr	Ile	Asn	165	170	175
Thr	Phe	Gln	Arg	Gly	Ser	Gln	Glu	Ser	Val	Trp	Glu	Thr	Val	Thr	Gln	180	185	190
Pro	Thr	Cys	Asp	Asn	Gly	Lys	Tyr	Gly	Gly	Ala	His	Gly	Tyr	Val	Asp	195	200	205
Leu	Phe	Ile	Gln	Gly	Ser	Thr	Pro	Pro	Gln	Trp	Lys	Tyr	Thr	Asp	Ala	210	215	220
Pro	Asp	Ala	Asp	Ala	Arg	Ala	Val	Gln	Ala	Ala	Tyr	Trp	Ala	Tyr	Thr	225	230	235
Trp	Ala	Ser	Ala	Gln	Gly	Lys	Ala	Ser	Ala	Ile	Ala	Pro	Thr	Ile	Ala	245	250	255
Lys	Ala	Ser	Gln	Thr	Gly	Asp	Tyr	Leu	Arg	Tyr	Ser	Leu	Phe	Asp	Lys	260	265	270
Tyr	Phe	Lys	Gln	Val	Gly	Asn	Cys	Tyr	Pro	Ala	Ser	Ser	Cys	Pro	Gly	275	280	285
Ala	Thr	Gly	Arg	Gln	Ser	Glu	Thr	Tyr	Leu	Ile	Gly	Trp	Tyr	Tyr	Ala	290	295	300
Trp	Gly	Gly	Ser	Ser	Gln	Gly	Trp	Ala	Trp	Arg	Ile	Gly	Asp	Gly	Ala	305	310	315
Ala	His	Phe	Gly	Tyr	Gln	Asn	Pro	Leu	Ala	Ala	Trp	Ala	Met	Ser	Asn	325	330	335
Val	Thr	Pro	Leu	Ile	Pro	Leu	Ser	Pro	Thr	Ala	Lys	Ser	Asp	Trp	Ala	340	345	350
Ala	Ser	Leu	Gln	Arg	Gln	Leu	Glu	Phe	Tyr	Gln	Trp	Leu	Gln	Ser	Ala	355	360	365
Glu	Gly	Ala	Ile	Ala	Gly	Gly	Ala	Thr	Asn	Ser	Trp	Asn	Gly	Asn	Tyr	370	375	380

Gly Thr Pro Pro Ala Gly Asp Ser Thr Phe Tyr Gly Met Ala Tyr Asp
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 Trp Glu Pro Val Tyr His Asp Pro Pro Ser Asn Asn Trp Phe Gly Phe
 405 410 415
 Gln Ala Trp Ser Met Glu Arg Val Ala Glu Tyr Tyr Tyr Val Thr Gly
 420 425 430
 Asp Pro Lys Ala Lys Ala Leu Leu Asp Lys Trp Val Ala Trp Val Lys
 435 440 445
 Pro Asn Val Thr Thr Gly Ala Ser Trp Ser Ile Pro Ser Asn Leu Ser
 450 455 460
 Trp Ser Gly Gln Pro Asp Thr Trp Asn Pro Ser Asn Pro Gly Thr Asn
 465 470 475 480
 Ala Asn Leu His Val Thr Ile Thr Ser Ser Gly Gln Asp Val Gly Val
 485 490 495
 Ala Ala Ala Leu Ala Lys Thr Leu Glu Tyr Tyr Ala Ala Lys Ser Gly
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 Asp Thr Ala Ser Arg Asp Leu Ala Lys Gly Leu Leu Asp Ser Met Trp
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 Asn Asn Asp Gln Asp Ser Leu Gly Val Ser Thr Pro Glu Thr Arg Thr
 530 535 540
 Asp Tyr Ser Arg Phe Thr Gln Val Tyr Asp Pro Thr Thr Gly Asp Gly
 545 550 555 560
 Leu Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly Asp Gln
 565 570 575
 Ile Lys Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Trp Tyr Thr Lys
 580 585 590
 Asp Pro Gln Trp Ser Lys Val Gln Ala Tyr Leu Asn Gly Gly Pro Ala
 595 600 605
 Pro Thr Phe Asn Tyr His Arg Phe Trp Ala Glu Ser Asp Phe Ala Met
 610 615 620
 Ala Asn Ala Asp Phe Gly Met Leu Phe Pro Ser Gly Ser Pro
 625 630 635

<210> 10
 <211> 640
 <212> PRT
 <213> Cellulomonas fimi

<400> 10
 Glu Tyr Ala Gln Arg Phe Leu Ala Gln Tyr Asp Lys Ile Lys Asp Pro
 1 5 10 15

Ala	Asn	Gly	Tyr	Phe	Ser	Ala	Gln	Gly	Ile	Pro	Tyr	His	Ala	Val	Glu	20	25	30
Thr	Leu	Met	Val	Glu	Ala	Pro	Asp	Tyr	Gly	His	Glu	Thr	Thr	Ser	Glu	35	40	45
Ala	Tyr	Ser	Tyr	Trp	Leu	Trp	Leu	Glu	Ala	Leu	Tyr	Gly	Gln	Val	Thr	50	55	60
Gln	Asp	Trp	Ala	Pro	Leu	Asn	His	Ala	Trp	Asp	Thr	Met	Glu	Lys	Tyr	65	70	75
Met	Ile	Pro	Gln	Ser	Val	Asp	Gln	Pro	Thr	Asn	Ser	Phe	Tyr	Asn	Pro	85	90	95
Asn	Ser	Pro	Ala	Thr	Tyr	Ala	Pro	Glu	Phe	Asn	His	Pro	Ser	Ser	Tyr	100	105	110
Pro	Ser	Gln	Leu	Asn	Ser	Gly	Ile	Ser	Gly	Gly	Thr	Asp	Pro	Ile	Gly	115	120	125
Ala	Glu	Leu	Lys	Ala	Thr	Tyr	Gly	Asn	Ala	Asp	Val	Tyr	Gln	Met	His	130	135	140
Trp	Leu	Ala	Asp	Val	Asp	Asn	Ile	Tyr	Gly	Phe	Gly	Ala	Thr	Pro	Gly	145	150	155
Ala	Gly	Cys	Thr	Leu	Gly	Pro	Thr	Ala	Thr	Gly	Thr	Ser	Phe	Ile	Asn	165	170	175
Thr	Phe	Gln	Arg	Gly	Pro	Gln	Glu	Ser	Val	Trp	Glu	Thr	Val	Pro	Gln	180	185	190
Pro	Ser	Cys	Glu	Glu	Phe	Lys	Tyr	Gly	Gly	Lys	Asn	Gly	Tyr	Leu	Asp	195	200	205
Leu	Phe	Thr	Lys	Asp	Ala	Ser	Tyr	Ala	Lys	Gln	Trp	Lys	Tyr	Thr	Ser	210	215	220
Ala	Ser	Asp	Ala	Asp	Ala	Arg	Ala	Val	Glu	Ala	Val	Tyr	Trp	Ala	Asn	225	230	235
Gln	Trp	Ala	Thr	Glu	Gln	Gly	Lys	Ala	Ala	Asp	Val	Ala	Ala	Thr	Val	245	250	255
Ala	Lys	Ala	Ala	Lys	Met	Gly	Asp	Tyr	Leu	Arg	Tyr	Thr	Leu	Phe	Asp	260	265	270
Lys	Tyr	Phe	Lys	Lys	Ile	Gly	Cys	Thr	Ser	Pro	Thr	Cys	Ala	Ala	Gly	275	280	285
Gln	Gly	Arg	Glu	Ala	Ala	His	Tyr	Leu	Leu	Ser	Trp	Tyr	Met	Ala	Trp	290	295	300
Gly	Gly	Ala	Thr	Asp	Thr	Ser	Ser	Gly	Trp	Ala	Trp	Arg	Ile	Gly	Ser	305	310	315

Ser His Ala His Phe Gly Tyr Gln Asn Pro Leu Ala Ala Trp Ala Leu
 325 330 335
 Ser Thr Asp Pro Lys Leu Thr Pro Lys Ser Pro Thr Ala Lys Ala Asp
 340 345 350
 Trp Ala Ala Ser Met Gln Arg Gln Leu Glu Phe Tyr Thr Trp Leu Gln
 355 360 365
 Ala Ser Asn Gly Gly Ile Ala Gly Gly Ala Thr Asn Ser Trp Asp Gly
 370 375 380
 Ala Tyr Ala Gln Pro Pro Ala Gly Thr Pro Thr Phe Tyr Gly Met Gly
 385 390 395 400
 Tyr Thr Glu Ala Pro Val Tyr Val Asp Pro Pro Ser Asn Arg Trp Phe
 405 410 415
 Gly Met Gln Ala Trp Gly Val Gln Arg Val Ala Glu Leu Tyr Tyr Ala
 420 425 430
 Ser Gly Asn Ala Gln Ala Lys Lys Ile Leu Asp Lys Trp Val Pro Trp
 435 440 445
 Val Val Ala Asn Ile Ser Thr Asp Gly Ala Ser Trp Lys Val Pro Ser
 450 455 460
 Glu Leu Lys Trp Thr Gly Lys Pro Asp Thr Trp Asn Ala Ala Ala Pro
 465 470 475 480
 Thr Gly Asn Pro Gly Leu Thr Val Glu Val Thr Ser Tyr Gly Gln Asp
 485 490 495
 Val Gly Val Ala Ala Asp Thr Ala Arg Ala Leu Leu Phe Tyr Ala Ala
 500 505 510
 Lys Ser Gly Asp Thr Ala Ser Arg Asp Lys Ala Lys Ala Leu Leu Asp
 515 520 525
 Ala Ile Trp Ala Asn Asn Gln Asp Pro Leu Gly Val Ser Ala Val Glu
 530 535 540
 Thr Arg Gly Asp Tyr Lys Arg Phe Asp Asp Thr Tyr Val Ala Asn Gly
 545 550 555 560
 Asp Gly Ile Tyr Ile Pro Ser Gly Trp Thr Gly Thr Met Pro Asn Gly
 565 570 575
 Asp Val Ile Lys Pro Gly Val Ser Phe Leu Asp Ile Arg Ser Phe Tyr
 580 585 590
 Lys Lys Asp Pro Asn Trp Ser Lys Val Gln Thr Phe Leu Asp Gly Gly
 595 600 605
 Ala Glu Pro Gln Phe Arg Tyr His Arg Phe Trp Ala Gln Thr Ala Val
 610 615 620

Ala Gly Ala Leu Ala Asp Tyr Ala Arg Leu Phe Asp Asp Gly Thr Thr
625 630 635 640

<210> 11
<211> 642
<212> PRT
<213> Thermobifida fusca

<400> 11
Ser Tyr Asp Gln Ala Phe Leu Glu Gln Tyr Glu Lys Ile Lys Asp Pro
1 5 10 15

Ala Ser Gly Tyr Phe Arg Glu Phe Asn Gly Leu Leu Val Pro Tyr His
20 25 30

Ser Val Glu Thr Met Ile Val Glu Ala Pro Asp His Gly His Gln Thr
35 40 45

Thr Ser Glu Ala Phe Ser Tyr Tyr Leu Trp Leu Glu Ala Tyr Tyr Gly
50 55 60

Arg Val Thr Gly Asp Trp Lys Pro Leu His Asp Ala Trp Glu Ser Met
65 70 75 80

Glu Thr Phe Ile Ile Pro Gly Thr Lys Asp Gln Pro Thr Asn Ser Ala
85 90 95

Tyr Asn Pro Asn Ser Pro Ala Thr Tyr Ile Pro Glu Gln Pro Asn Ala
100 105 110

Asp Gly Tyr Pro Ser Pro Leu Met Asn Asn Val Pro Val Gly Gln Asp
115 120 125

Pro Leu Ala Gln Glu Leu Ser Ser Thr Tyr Gly Thr Asn Glu Ile Tyr
130 135 140

Gly Met His Trp Leu Leu Asp Val Asp Asn Val Tyr Gly Phe Gly Phe
145 150 155 160

Cys Gly Asp Gly Thr Asp Asp Ala Pro Ala Tyr Ile Asn Thr Tyr Gln
165 170 175

Arg Gly Ala Arg Glu Ser Val Trp Glu Thr Ile Pro His Pro Ser Cys
180 185 190

Asp Asp Phe Thr His Gly Gly Pro Asn Gly Tyr Leu Asp Leu Phe Thr
195 200 205

Asp Asp Gln Asn Tyr Ala Lys Gln Trp Arg Tyr Thr Asn Ala Pro Asp
210 215 220

Ala Asp Ala Arg Ala Val Gln Val Met Phe Trp Ala His Glu Trp Ala
225 230 235 240

Lys Glu Gln Gly Lys Glu Asn Glu Ile Ala Gly Leu Met Asp Lys Ala
245 250 255

Ser Lys Met Gly Asp Tyr Leu Arg Tyr Ala Met Phe Asp Lys Tyr Phe
 260 265 270
 Lys Lys Ile Gly Asn Cys Val Gly Ala Thr Ser Cys Pro Gly Gly Gln
 275 280 285
 Gly Lys Asp Ser Ala His Tyr Leu Leu Ser Trp Tyr Tyr Ser Trp Gly
 290 295 300
 Gly Ser Leu Asp Thr Ser Ser Ala Trp Ala Trp Arg Ile Gly Ser Ser
 305 310 315 320
 Ser Ser His Gln Gly Tyr Gln Asn Val Leu Ala Ala Tyr Ala Leu Ser
 325 330 335
 Gln Val Pro Glu Leu Gln Pro Asp Ser Pro Thr Gly Val Gln Asp Trp
 340 345 350
 Ala Thr Ser Phe Asp Arg Gln Leu Glu Phe Leu Gln Trp Leu Gln Ser
 355 360 365
 Ala Glu Gly Gly Ile Ala Gly Gly Ala Thr Asn Ser Trp Lys Gly Ser
 370 375 380
 Tyr Asp Thr Pro Pro Thr Gly Leu Ser Gln Phe Tyr Gly Met Tyr Tyr
 385 390 395 400
 Asp Trp Gln Pro Val Trp Asn Asp Pro Pro Ser Asn Asn Trp Phe Gly
 405 410 415
 Phe Gln Val Trp Asn Met Glu Arg Val Ala Gln Leu Tyr Tyr Val Thr
 420 425 430
 Gly Asp Ala Arg Ala Glu Ala Ile Leu Asp Lys Trp Val Pro Trp Ala
 435 440 445
 Ile Gln His Thr Asp Val Asp Ala Asp Asn Gly Gly Gln Asn Phe Gln
 450 455 460
 Val Pro Ser Asp Leu Glu Trp Ser Gly Gln Pro Asp Thr Trp Thr Gly
 465 470 475 480
 Thr Tyr Thr Gly Asn Pro Asn Leu His Val Gln Val Val Ser Tyr Ser
 485 490 495
 Gln Asp Val Gly Val Thr Ala Ala Leu Ala Lys Thr Leu Met Tyr Tyr
 500 505 510
 Ala Lys Arg Ser Gly Asp Thr Thr Ala Leu Ala Thr Ala Glu Gly Leu
 515 520 525
 Leu Asp Ala Leu Leu Ala His Arg Asp Ser Ile Gly Ile Ala Thr Pro
 530 535 540
 Glu Gln Pro Ser Trp Asp Arg Leu Asp Asp Pro Trp Asp Gly Ser Glu
 545 550 555 560

Cont
A4

17

Gly Leu Tyr Val Pro Pro Gly Trp Ser Gly Thr Met Pro Asn Gly Asp
565 570 575

Arg Ile Glu Pro Gly Ala Thr Phe Leu Ser Ile Arg Ser Phe Tyr Lys
580 585 590

Asn Asp Pro Leu Trp Pro Gln Val Glu Ala His Leu Asn Asp Pro Gln
595 600 605

Asn Val Pro Ala Pro Ile Val Glu Arg His Arg Phe Trp Ala Gln Val
610 615 620

Glu Ile Ala Thr Ala Phe Ala Ala His Asp Glu Leu Phe Gly Ala Gly
625 630 635 640

Ala Pro

Sub
C6